Canadian Journal of Psychology

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D. O. Hebb, *Chairman*J. Blackburn, R. B. Malmo, N. W. Morton, C. R. Myers

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TABLE OF CONTENTS

VOLUME 5, 1951

No. 1, MARCH

Some Rorschach Findings in Cases of Duodenal Ulcer: A Quantitative Study: MALCOLM BROWN, F. C. R. CHALKE, BARBARA PETERS, E. G. POSER,	
MARY QUARRINGTON	1
Studies on Visual Flicker and Fusion.	
II. Effects of Timing of Visual Stimuli on Binocular Fusion and Flicker: C. H. Baker and E. A. Bott.	9
The Effect of General and of Specific Labelling on Judgmental Scales: B. R. Phillip	18
Psychological Factors in Industrial Organization Affecting Employee Stability: John C. Sawatsky	29
Book Review	39
Canadian Theses in Psychology, 1950	43
No. 2, June	
A Factorial Study of Tests of Rigidity: John A. Oliver and George A. Ferguson	49
The Psychology of Religion after Fifty Years: F. HILTON PAGE	60
The Net of Reciprocal Influence.	
Study II: The Balance of Power: JOHN R. SEELEY	68
The Relation of Experience to the Development of Hunger: Lila Chent	77
The Statistical Analysis of the Rosvold and Mishkin Data: D. C. BAILLIE and	
D. A. S. Fraser	82
Book Reviews	85
No. 3, September	
Time, Values, and Social Organization: J. D. KETCHUM	97
Recent Electrophysiological Studies of the Cerebral Cortex: Implications for	0.
Localization of Sensory Functions: John P. Zubek	110
A Closed-Field Intelligence Test for Rats: M. S. RABINOVITCH and H. ENGER ROSVOLD	122
A New Closure Test: C. M. Mooney and G. A. Ferguson	129
Personality Factors Associated with Paraplegia and Prolonged Hospitalization:	
A Clinical Note: Herbert Dörken	134
Book Reviews	138

No. 4, DECEMBER

Socio-Economic Status and Predictive Test Scores: W. W. TURNBULL	145
Individual Differences in Dogs: Preliminary Report on the Effects of Early	
Experience: R. S. Clarke, W. Heron, M. L. Fetherstonhaugh, D. G.	
FORGAYS, and D. O. HEBB	150
Approaches to the Experimental Study of the Rorschach Test: G. A. FERGUSON	157
Blood Pressure Response to Repeated Brief Stress in Psychoneurosis: A Study	
of Adaptation: R. B. Malmo, C. Shagass, and R. M. Heslam	167
Book Reviews	180





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March, 1951

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CONTENTS

Some Rorschach Findings in Cases of Duodenal Ulcer: A Quantita-	
tive Study: Malcolm Brown, F. C. R. Chalke, Barbara Peters,	
E. G. Poser, Mary Quarrington	1
Studies on Visual Flicker and Fusion.	
II. Effects of Timing of Visual Stimuli on Binocular Fusion and	
Flicker: C. H. Baker and E. A. Bott	9
The Effect of General and of Specific Labelling on Judgmental Scales: B. R. Philip	18
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Stability: John C. Sawatsky	28
Book Review	38
Canadian Theses in Psychology, 1950	43

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Canadian Journal of Psychology

SOME RORSCHACH FINDINGS IN CASES OF DUODENAL ULCER: A QUANTITATIVE STUDY¹

MALCOLM BROWN, F. C. R. CHALKE, BARBARA PETERS, E. G. POSER, MARY QUARRINGTON

Department of Medicine, Queen's University

In recent years there has been increasing speculation concerning the association between specific personality factors and gastro-intestinal disorders. Much evidence from psychoanalytical and other clinical sources has been accumulated, but there is need for more precise description of the nature and extent of personality variables that differentiate patients with one clinical syndrome from those with another. Moreover, the method of investigation should preferably enable comparison between individuals and groups on an objective basis. At the same time the method should be designed to cause the least possible distortion of the subject's usual reaction pattern. For this reason the Rorschach technique was selected as one of several methods for the study of personality factors in patients with duodenal ulcer.

The Rorschach technique provides a method by which the dynamic organization of personality structure can be objectively represented and quantitatively evaluated on the basis of an individual's responses to ten standardized ink blots. The technique has already been used to study the relationship between personality traits and psychosomatic entities such as bronchial asthma (14), rheumatic disease (6), migraine headaches (12), neurocirculatory asthenia (11), and so on. Evidence obtained from these studies serves to amplify and validate the results of subjective personality study and lends itself to independent verification. The present report concerns the Rorschach performance of patients with duodenal ulcer as compared to a group of non-ulcer controls.

¹This investigation was supported in part by the National Research Council of Canada and the United States Public Health Service. The work reported here is part of a project being conducted in this Department on psychological, physiological, and anthropometric aspects of persons suffering from gastro-intestinal disease. The methods of psychological study also include the T.A.T., psychiatric interviews, and an Annoyance Test (2).

The authors wish to acknowledge their indebtedness to Dr. B. R. Philip of the Department of Psychology, Queen's University, for assistance in the presentation of these findings. For collaboration at an early stage of this project and for helpful suggestions in connection with the preparation of this paper, thanks are due to Dr. W. D. Ross now of the Department of Psychiatry, University of Cincinnati, Chairman of the Research Committee of the Society for Projective Techniques and Rorschach Institute, Inc.

^{*}Associate Professor of Medicine.

CLINICAL MATERIAL

The experimental group² consisted of 25 male war veterans receiving treatment for duodenal ulcer. In each case the presence of an ulcer niche had been demonstrated by radiography. Ages ranged from 23 to 53 with 72 per cent of the cases falling between 30 and 50.

The control group² was made up of 25 veterans hospitalized for various complaints, none of which could be referred to the gastro-intestinal tract (see Table I). There was no mention of gastro-intestinal disturbance in the medical history of any of these cases. Their ages ranged from 21 to 60 with 68 per cent falling between 30 and 50.

TABLE I
DIAGNOSTIC CLASSIFICATION OF CONTROL GROUP

Diagnosis	Number of Cases
Chronic Bronchitis	7
Coronary Heart Disease	5
Diabetes Mellitus	3
Rheumatic Heart Disease	2
Bronchiectasis	1
Chronic Chorioretinitis	1
Chronic Nephritis	1
Chronic Sinusitis	1
Hypertension	1
Osteoarthritis	1
Pes Cavus	1
Prolapsed Intervertebral Disc	1
Total	25

A medical and psychiatric history was obtained from every patient, and while no psychometric data are presently available, no marked discrepancy between the intelligence levels of the two groups was observed. A comparison of the socio-economic and marital status of the groups failed to reveal any appreciable differences.

PROCEDURE

The Rorschach test was administered individually to every subject. Both the administration and the scoring of responses were carried out according to the system of the Rorschach Institute (7). Interpretations of individual records were not attempted. Instead, all responses given were tabulated according to their appropriate scoring categories, of which

²The patients studied were under the care of the Department of Veterans' Affairs Medical Service at the Kingston General Hospital and the Hotel Dieu Hospital, Kingston, Ontario.

28 were considered. Of these, 5 concerned location, 13 determinants, and 10 the content of responses. In each case the number of responses and the reaction time were also noted. Up to this point, only the absolute frequencies of the various categories were used. In addition to this procedure, some of the factors were then tabulated again in terms of percentages of the total number of responses or in combination with certain other important factors as described by Klopfer and Kelley (7). Scoring categories in which less than 15 responses occurred in either group, and where the difference between the two groups was not significant, were eliminated from this study. The remaining categories appear in Table II.

RESULTS

The mean score per subject and the S.D.'s of the distributions together with the computed reliabilities of the differences in variability between the groups are shown in Table II.

TABLE II
DISTRIBUTION AND VARIABILITY OF SCORES IN EACH CATEGORY

		S	ummar	y of Sco in Each	Group Differences in Variability					
Scoring Category		Ex	perime	ntal		Contro	1	in variability		
		Total	Mean	S.D.	Total	Mean	S.D.	ŧ	F	
Responses	R	301	12.04	6.13	356	14.24	6.16	.02	not significant	
Av. Reaction Time in secs.	RT	644	25.76	13.94	1009	40.36	20 05	1 05	- 01	
Whole	W	186	7.44	2.17	177	7.08	39.85		< .01	
Detail	D	95	3.80	4.10	153	6.12	2.04	1	not significant	
Movement	M	25	1.00	0.97	38	1.52	1.38	1.66	not significant	
Animal Movemen		82	3.28	2.27	68	2.72	2.14		.10	
Form	F	93	3.72	2.80	110	4.40	2.14		not significant	
Texture	Fc	27	1.08	0.88	42	1.68	1.71	3.22	not significant	
Form-Colour	FC	15	0.60	0.83	21	0.84	1.63		< .01	
Colour-Form	CF	23	0.92	0.88	1	0.88	1.23	1.60	.13	
Popular	P	108	4.32	1.44	1	4.08	1.38	.20	not significant	
Human	H	26	1.04	0.95	33	1.32	1.31		not significant	
Animal	A	127	5.08	2.43	129	5.16	3.48		not significant	
Object	Obi.	52	2.08	1.38	45	1.80	1.53		not significant	
Anatomy	At.	20	.80	1.18	-	1.20	2.36		< .01	
Animal Detail	Ad	18	0.72	1.30	31	1.24	1.22	-	not significant	
F/R	F%	738	29.52	13.30	781	31.24	16.20		not significant	
A + Ad	A%	1223	48.92	14.04	1154	46.16	23.82	2.44	.02	
R R ₈ , ₉ , ₁₀	%	703	28.12	9.32	829	33.16	13.17	2.32	.03	
R										

Significant differences in variability were obtained for two determinants (FC, Fc), two content scores (At, A%), also for average reaction time (Av. R.T.) and for the percentage of responses to the last three

cards
$$\left(\frac{R_{8, 9, 10}}{R}\right)$$

Although only 6 out of 19 categories in the table are significantly different in their variabilities, the trend is consistently toward greater variability in the control group. Greater variability for the experimental group occurs in only four of the nineteen categories and in no case is it either large or significant.

The second point that emerged from this preliminary study deals with the introversion-extraversion concept or "experience balance." In the Rorschach test the following three measures of introversion-extraversion, based upon some configuration of scores, are used:

- (a) The M:sum C ratio (Rorschach 12), (Klopfer 7)
- (b) The (FM+m):(Fc+c+C') ratio (Klopfer 7)
- (c) The percentage of responses to the last three cards (Klopfer 7)

The criteria that were taken to determine extraversion-introversion for these measures are listed in Table III. The subjects in both the experimental and the control group were classified as E, A, or I, based

TABLE III
CRITERIA OF CLASSIFICATION FOR EACH MEASURE

Measure	E	A	I
(a)	M < sum C	M = sum C	M > sum C
(b)	(FM + m) < (Fc + c + C')	(FM + m) = (Fc + c + C')	(FM + m) > (Fc + c + C')
(c)	$\frac{R_{8, 9, 10}}{R} > 40\%$	$\frac{R_{8, 9, 10}}{R} = 30 - 40\%$	R ₈ , 9, 10 < 30%

upon each of the three measures. To show these discrepancies, Table IV was compiled. It indicates the frequency with which measure (a), the most important measure of E-A-I, either agreed with the other two measures, differed from one of them, or differed from both. These discrepancies are indicated in the first column of Table IV and the corresponding percentages of categorization (E, A, or I) are given for both groups. Thus Table IV indicates that when measure (a) yielded a categorization that differed from the two other measures, the percentages of the experimental group that were determined as E, A, or I respectively, are 40, 8, and 4, while for the control group the percentages are respectively 8, 8, and 12. A survey of Table IV indicates that where the E

TABLE IV
PERCENTAGE OF DISCREPANCY BETWEEN MEASURES OF INTROVERSION-EXTRAVERSION

Dis- crepancy Type	Me	asure (a) =	E	Mea	sure (a) =	A	Me	asure (a) =	I		Tota	1	
	Exp.	Contr.	t	P	Exp.	Contr.	t	P	Exp.	Contr.	t	P	Exp.	Contr.	t	P
0	0	4	1.0	.40	4	4			12	16	.40	.70	16	24	.69	. 50
1	16	24	.69	.50	0	4		.40	16	20	.36	.75	32	48	1.15	.25
2	40	8	2.81	.01	8	8			4	12	1.03	.30	52	28	1.75	.09
Total %	56	36	1.43	. 20	12	16	.40	.70	32	48	1.14	.25	100	100		

categorization from measure (a) is at variance with that of the other two measures, there is a significant difference between the ulcer and the control group. Furthermore, from the "Total" column of the same table it is seen that the experimental group more frequently shows a discrepancy of two than the control group, while the reverse holds for discrepancies one and zero.

Additional evidence may be seen from Table V which gives the frequency of each category of E, A, and I for all three measures in both groups. It is readily noted that in the experimental group there is a marked predominance of E over I cases for measure (a), while the reverse is quite apparent for measures (b) and (c). In the control group there is no clear-cut predominance of either E, A, or I by any measure.

TABLE V
EXPERIENCE BALANCE CATEGORIES

Category	Number of Cases Under Each Measure								
Category	Expe	rimental (Group	Co	ontrol Gro	up			
	(a)	Measure (b)	(c)	(a)	Measure (b)	(c)			
E	14	3	4	9	10	8			
A	3	6	5	4	6	4			
I	8	16	16	12	9	13			

DISCUSSION

The results of the investigation show that the Rorschach test, objectively scored, yields statistically significant differences in the records of the two groups under consideration. Differences between means were not significant, but reliable differences in variability were found in six of the factors considered. In each case, the variability of scores was smaller in the experimental group of ulcer patients than in the control

group, that is, in patients with diverse clinical syndromes. Since the calculation of differences in variability in small samples is, however, strongly affected by atypical scores, it is felt that the six specific factors are not as important as the general trend toward greater variability in the control group on 15 out of 19 categories scored. It thus appears that a greater degree of homogeneity in certain personality factors exists in the experimental group. There were no factors in which a significantly greater

degree of homogeneity occurred in the control group.

The ratios in Table IV provide a numerical expression of what has long been considered a fundamental personality trend. The M:sum C ratio (where M stands for movement and C for colour responses) first used by Rorschach, suggests introversive trends when M>sum C and extroversive tendencies when M<sum C. The latter configuration was found in 36 per cent of controls and in 56 per cent of the ulcer group. Yet in 71 per cent of these same ulcer patients the other two indicators of "experience balance" point toward introversion. The same is true of only 22 per cent of extroversive control cases. The tendency for ulcer patients to show a discrepancy between categorization of E and I by the three measures has also been shown in Table V. Such discrepancy is not found in the control group.

In so far as such discrepancies between the M:sum C quotient and the other two measures are considered Rorschach signs representing a possible source of conflict, it may well be that this condition is related to the personality stresses clinically observed in ulcer patients and referred to by Alexander (1), Cathcart (3), Ivy (4), Kapp et al. (5), Mittelmann and Wolff (8), Robinson (9), Ruesch et al. (13), and others.

Any interpretation of these findings in qualitative terms must necessarily be tentative pending more extensive analysis of this and other test material. On the other hand the distribution of Rorschach factors, as revealed in this study, can provide a preliminary orientation to those areas of personality organization in which ulcer patients appear to deviate from normal expectancy.

Thus, it was seen that ulcer patients, as a group, vary less than the controls in their rapidity of responding to the environment (average

reaction time), in their responsiveness to external stimulation $\left(\frac{R_{8, 9, 10}}{R}\right)$ and in the degree of stereotypy of their responses (At., A%). The difference in variability of the other two factors, relevant to emotional maturity (FC) and social adjustment (Fc) respectively, is not so pronounced in terms of distribution of scores throughout the group.

In 50 per cent of the ulcer group the average reaction time to the cards was less than 20 seconds and in no case did it exceed 60 seconds. In the control group, by contrast, an average reaction time greater than 60 seconds was noted in 20 per cent of the cases. Again the percentage

of responses to the last three cards was below average (that is, 30 per cent or less) in 64 per cent of the ulcer group as against 52 per cent of the control group. An animal percentage of 50 per cent or more occurred in 52 per cent of the ulcer group and 40 per cent of controls, whereas percentages of 30 and less were seen in 4 per cent of the ulcer group but in 28 per cent of controls. It has been pointed out earlier that comparison of the mean scores of the groups, on any scoring category, revealed no significant differences. At the same time there are trends in the group data that may well reveal some characteristic pattern for ulcer bearers when larger numbers of patients and controls are studied. Such a trend is seen in the ulcer patients' impulsive response to the environment (Aver.R.T., CF>FC) to which they react in an impersonal, noncommittal manner (A%, W>D). In marked contrast to their extrovert adjustment at the level of social interpersonal relationships (M:sum C) they often show a predominantly egocentric tendency at the level of more instinctual strivings (FM+m) and a relative avoidance of external

stimulation $\left(\frac{R_{8,\ 9,\ 10}}{R}\right)$. Moreover, this discrepancy between measures of experience balance seems to reflect a conflict between the patient's desire to appear overtly active and his actual wish to be passive. A similar theory, based on the analysis of need variables in ulcer patients, has been advanced by Ruesch et al. (13), who also found Rorschach evidence of the ulcer patient's unusual immaturity. Of this there is considerable

indication in the present study (FM > M, CF > FC, A%).

In addition to the formal aspects of Rorschach performance, an analysis of the content was undertaken to discover possible group differences in content emphasis. In general, the responses of the control group showed a wider range of association and more elaborate organization of concepts. Ulcer patients more often gave the obvious or conventional response and rarely provided spontaneous specifications. Content referable to "oral" preoccupations, such as "mouths," "food," etc. occurred somewhat more frequently in ulcer patients but received no major emphasis in either group. The same was true of "aggressive" content which in the ulcer group occurred mainly on Cards 2 and 3. Thus, "fighting bears" on Card 2, not seen by any control subjects, were seen by four ulcer patients. Affectively toned responses to this card are often determined by the intense red colouring of the blot, yet none of the ulcer patients acknowledged the attribute of colour as a major determinant of their concept. This may well be taken as yet another indication of the ulcer patient's inability to accept his emotional promptings. These he experiences as a threat which he seeks to evade by rationalization. A marked predominance of instinctual over creative drives (FM>M) further complicates the ulcer patient's adjustment.

SUMMARY

The Rorschach test was administered under standard conditions to a group of 25 patients with duodenal ulcer and an equal number of cases with various nongastro-intestinal diseases. The responses were scored by Klopfer and Kelley's method and the differences between the two groups were compared and statistically evaluated. The absolute frequency of scores as well as ratios and percentages were considered and it was found that, in general, the Rorschach performance of ulcer patients is less variable than that of a group of cases with various disorders.

The relationship between various Rorschach indicators of extraversion and introversion, as expressed by three independent ratios, showed a significantly greater number of ulcer patients to have the Misum C ratio at variance with the other two indicators of "experience balance." This discrepancy was interpreted as a Rorschach representation of the ulcer patients' conflict between an overtly active disposition on the one hand and passive needs on the other,

A tentative interpretation of the quantitative data in psychodynamic terms suggests that ulcer patients as a group tend to deal with their environment at an impulsive, emotionally immature level leading to conflict in the area of social interpersonal relationships.

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STUDIES ON VISUAL FLICKER AND FUSION

II. Effects of Timing of Visual Stimuli on Binocular Fusion and Flicker¹

C. H. BAKER and E. A. BOTT University of Toronto

This experimental study grew out of Sherrington's classical investigation entitled "On Binocular Flicker and the Correlation of Activity of Corresponding Retinal Points" (3). Sherrington wished to determine whether integration of sensory experience depended on the integrative action of a central physiological process, as he had demonstrated to be the case for motor responses (4). For a criterion of sensory integration he chose binocular fusion with its critical flicker rate, which is easily measured in terms of the rate of alternation of an interrupted visual stimulus upon the retina. He argued that if this sensory phenomenon (flicker-fusion) were dependent on a central physiological activity, then assuming one could facilitate or impede such a central activity, this central control should correspondingly affect the sensory phenomenon, i.e. should modify the critical rate of stimulus presentation required for flicker.

Sherrington's experimental plan for controlling the central activity consisted in giving an interrupted visual stimulus to both eves by means of an apparatus which permitted the bright and dark stimulus periods to be out of step to any desired amount for the respective eyes. He chose three degrees of synchrony for presenting stimuli to corresponding areas of the fovea, namely, (1) completely synchronous, (2) half synchronous, plus half opposed, (3) completely opposed. He assumed that this arrangement of peripheral stimuli would affect the central process appreciably, for example, (1) by simultaneous stimulation from both eyes (though intermittent), or at the other extreme (2) by continuous stimulation (though first from one eye, then the other), or again by the condition (3) which was intermediate between these extremes. Using six subjects for sensory observation, he found that there was only a "very small" difference in their fusion rate for his two extreme conditions in synchrony of visual stimuli which he did not consider significant (although condition (3) was consistently a lower rate), and that for the intermediate condition their fusion rate was indistinguishable from either monocular rate. He concluded that sensory integration was "psychical" in character and independent of a central physiological process.

The present study was planned to cover two points: First, to repeat and extend Sherrington's experiment on synchrony of stimuli for an effect

¹Acknowledgment is made by the authors to the Associate Committee on Applied Psychology of the National Research Council, Ottawa, for a grant in support of this research.

on critical flicker rate; second, to alter the manner of exposing and occluding a stimulus on a retina, that is, to use not only Sherrington's plan for "progressive" control of stimulation across the area concerned in each retina (i.e. by a revolving sector disk), but also to provide for "instantaneous" control of stimulation over the retinal area (i.e. by illuminating with a neon source that could be cut off or on). Sherrington utilized only a "progressive" form of stimulus control, by means of a revolving sector shutter.

APPARATUS

The apparatus was arranged so that each eye, singly or with the other, could view two vertically juxtaposed circular apertures covered with milk glass. Each aperture was 53 minutes in visual diameter in order to ensure foveal vision when fixated, and the two were vertically separated three degrees (from their centres), the right and left pairs being level horizontally. Each aperture was illuminated from behind by a separate neon lamp and was surrounded by a dark field. The apertures could be flashed on and off (with any desired degree of synchrony) but by different means. One plan illuminated the apertures instantaneously (a characteristic of neon lights) by means of a rotating commutator operating the neon lamp, equal arcs of the commutator circumference being alternately insulated from and in contact with the neon light source. The other plan used progressive occlusion by synchronously rotating sector disks in front of the aperture which was illuminated by a steady neon lamp.

OBSERVATIONAL TASK

With either method of presentation the task was to observe, as the frequency of intermittence was decreased, the first perceptible flicker. This critical flicker observation was reported by touching a button which permitted the particular frequency of stimulus interruption to be recorded.

For binocular observations two identical apertures vertically aligned were shown to each eye in a horizontally adjacent position. The two monocular fields were then binocularly superimposed by means of specially adjustable fluid prisms. Critical flicker frequencies were recorded by Westinghouse tachometers. When flicker was just perceptible, the subject pressed a button which prevented further frequency decrease and the experimenter read the critical speed of revolution from the tachometer dial. Each aperture was bisected by a hair line to assist with accurate superposition, the left lines being vertical and the right lines horizontal. When the four apertures were binocularly combined they were seen by subjects as two bright disks, one vertically above the other, and each divided into quadrants by two black cross lines.

SUBJECTS

Four trained subjects were employed, each using three brightness levels for binocular fusion, namely, 8, 5.5, and 3 foot-lamberts. At each brightness level five degrees of synchrony were used (instead of Sherrington's three)—fully synchronous, 1/4, 1/2, 3/4 out of step, and full opposition. Six readings for "instantaneous" stimulation and also for "progressive" stimulation were taken in alternate order. These readings were separately averaged for each subject on each brightness level and each degree of synchrony.

Метнор

Sherrington's method had been to show two illuminated apertures adjacently and simultaneously in the field, for subjects to observe which flickered first. It was originally intended that both our "progressive" and "instantaneous" flickering sources should operate simultaneously in the field, i.e. in the upper and lower apertures respectively, and that the subjects should determine, by a slight movement of the eyes for fixation, whether flicker was perceptible at the upper aperture before the lower, as the frequency was decreased identically for them both. It was found, however, that visual fixation of one source resulted in peripheral retinal stimulation by the non-fixated aperture. Because adjacent peripheral retinal areas are more sensitive to flicker than are foveal areas, it often happened that subjects perceived flicker in the non-fixated source before it was apparent in the fixated one, because of differences in retinal areas stimulated rather than of methods of occlusion.

Since it was found impractical to deal with two foveal areas simultaneously for flicker comparison purposes, the method finally employed was to determine critical flicker frequency first by fixating that aperture which used instantaneous presentation and then the aperture that had progressive presentation. At no time were subjects informed whether the source was "progressive" or instantaneous." In this manner twelve readings (six instantaneous and six progressive, in alternate order) were taken for each degree of synchrony and at each brightness level for each subject.

A major difficulty in undertaking these experiments was the control of dark adaptation. It is apparent from a review of the literature on foveal dark adaptation that there are differences of opinion about whether or not such a phenomenon occurs. In our experience it does occur and influences foveal flicker frequency, hence the state of adaptation must be controlled if foveal flicker frequencies are to be used for comparison purposes. Accordingly, all subjects underwent a half-hour dark adaptation period before readings were taken.

The discrimination of just perceptible flicker in an otherwise steady field is a difficult task. Originally subjects made twenty discriminations at each brightness level and for each degree of synchrony under both "instantaneous" and "progressive" conditions. Means of these were interpreted to be the most valid measures of critical flicker frequencies of the conditions concerned. However, ocular fatigue was indicated by the tendency for variability in readings to increase during long observation periods, and consequently subjects were later asked to make only six discriminations for each method of occlusion, brightness level, and degree of synchrony.

RESULTS

In order to make a comparison between Sherrington's results and those reported here, his flicker frequencies for synchronous and opposed stimulus presentation are shown in Figure 1. This is a graphical repre-

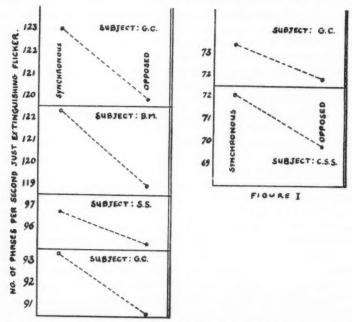


FIGURE 1. Showing the "very small" difference between the frequency of intermittence required for extinction of flicker in the synchronous and opposed combinations, for four of Sherrington's subjects. The various absolute values are a result of the various brightnesses used.

sentation of the only numerical values Sherrington gave to point up what he termed a "very small" difference between the synchronous and opposed arrangement.

Methodologically, both Sherrington's experiments and those reported here were similar in that subjects were confronted with a steady field and the rate of alternation was gradually decreased until flicker became

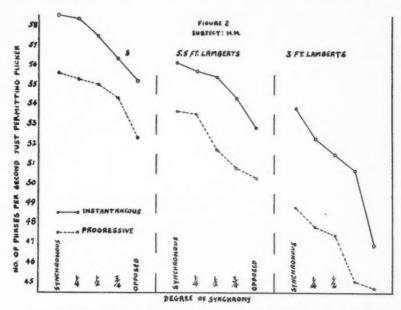


FIGURE 2. Showing the instantaneous and progressive frequencies of intermittence required to just permit flicker, for five degrees of synchrony and for three brightness levels.

apparent. Sherrington also tried the reverse approach, i.e. subjects were presented with a flickering field and the rate of alternation was gradually increased until flicker was no longer apparent, i.e. the initial fusion rate. This is an even more difficult observation to make than that for initial flicker, and Sherrington soon abandoned it. The critical flicker frequency can be more consistently and accurately observed. Figure 1 is a graphic representation of Sherrington's critical flicker frequencies. These data may be directly compared with those shown in Figures 2, 3, 4, and 5.

Results from the four subjects reported in the present experiments are shown in Figures 2, 3, 4, and 5, any one of which is representative of the general results. All five figures are drawn to the same scale so that a direct comparison can be made between Sherrington's synchronous-opposed difference and that which we found under the conditions here reported.

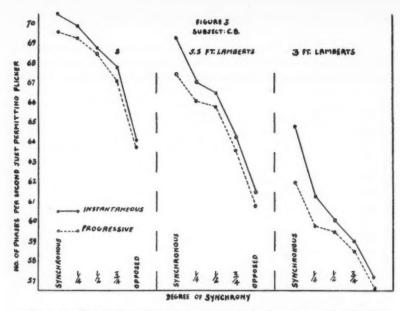


FIGURE 3. Showing the instantaneous and progressive frequencies of intermittence required to just permit flicker, for five degrees of synchrony and for three brightness levels.

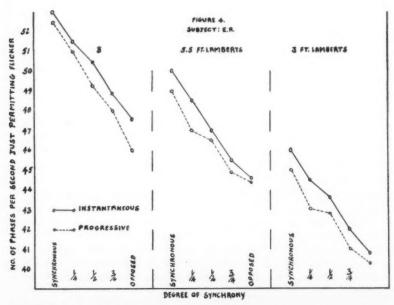


FIGURE 4. Showing the instantaneous and progressive frequencies of intermittence required to just permit flicker, for five degrees of synchrony and for three brightness levels.

DISCUSSION

It is evident from Figures 2, 3, 4, and 5 that binocular flicker using "instantaneous" stimulation is perceptible at a higher rate of frequency of intermittence than is that with the "progressive" type of stimulation, when other conditions are identical. This difference is consistent for three brightness levels and for all degrees of synchrony. This consistency of difference between "instantaneous" and "progressive" stimulation suggests that binocular fusion involves more than the stimulating of both eyes; it involves, for instance, the time order in the stimulating of adjoining

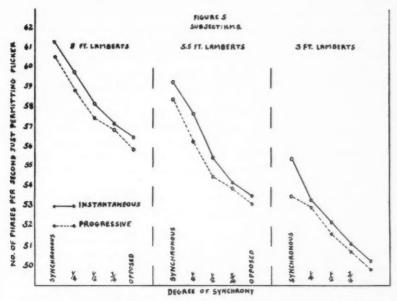


FIGURE 5. Showing the instantaneous and progressive frequencies of intermittence required to just permit flicker, for five degrees of synchrony and for three brightness levels.

retinal endings; and this latter variable of peripheral timing in turn suggests that binocular fusion involves a further integrating process at some afferent or central level.

Again, to consider the difference between synchronous and opposed stimuli presentation, Sherrington's figures, while being somewhat higher for flicker rates than those reported here (perhaps due to greater brightness used) are nevertheless comparable. He holds that these differences (approximately 2%) are very small and that "so far from bright phases

at one eye effacing dark phases at the corresponding spot of the other eye, there is hardly the merest trace of such interference." Figures 2, 3, 4, and 5, however, show a somewhat greater difference (approximately 9%). This amount of difference seems too great and too consistent to be thus dismissed as insignificant. Similar results have recently been reported by Ireland (1).

One possible factor which might account for Sherrington's small differences is the effect of non-fixated stimulation. Sherrington's subjects were confronted with two stimulus apertures (one synchronous and one opposed) which operated simultaneously. "The foveal gaze could be turned from one to the other of them when and as often as the observer desired, and in the fraction of a second by a slight, i.e. less than 3 degree, movement of the eyeballs." It is a fact that a steady stimulus applied to one region of the retina modifies the critical flicker frequency of an intermittent stimulus in another. Such being the case, it may be questioned whether Sherrington's readings were as accurate as he intended.

Conclusions

1. In order for an intermittent brightness area source to be just perceptible as flicker at the fovea, the rate of intermittence can be greater if the source is instantaneously occluded (i.e. for the whole area at once) than it can be if it is progressively occluded (i.e. by a shutter moving with a given direction and rate).

2. There is reason to believe that Sherrington's description of binocular fusion as a psychical phenomenon can be explained, in part at least, as involving a central process.

3. Whereas Sherrington found a difference of approximately 2% between critical flicker frequencies for the synchronous and opposed arrangements, the difference here found for those conditions was appreciably more, approximately 9%.

PLAN OF FUTURE STUDY

The difference found in this study between synchronous and opposed stimulus presentation is still not very great (although it is greater than that found by Sherrington). It is possible that the smallness of this difference is because any stimulus to the retinal area of either eye is conducted to both occipital lobes, because of partial decussation of the optic nerves at the chiasma. It is hoped to construct an apparatus which will permit experimental manipulation of visual stimuli to the nasal and temporal halves of the retina independently. Assuming that these retinal halves are neurologically connected through the chiasma to the respective central lobes (2), it would then be possible to activate either lobe alone, or both lobes, by the control of retinal stimulation. In this manner the ques-

tion of central integration might be approached experimentally rather than wholly inferentially.

Thus, supposing a central process to be involved in binocular flicker fusion, it would be expected that intermittent stimulation of a single lobe by means of a binocular stimulus, or of both lobes by means of a monocular stimulus, would result in differential flicker rates for synchronous and opposed conditions of presentation similar to those reported in this paper and also by Sherrington. The conclusion would then be strengthened that binocular fusion is dependent on a central process and is not wholly a "psychic" phenomenon.

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THE EFFECT OF GENERAL AND OF SPECIFIC LABELLING ON JUDGMENTAL SCALES

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THE material used in the study of judgmental scales has been chiefly perceptual, or at least has contained a large perceptual element. Aesthetic material has been more rarely studied, partly because of the difficulty of obtaining an adequate number of comparable units for scale formation, but also because fractionalization of aesthetic material affects its beauty.

The experiment here reported is a study of judgmental scales based upon the rating of single lines of poetry for melody. This type of material, which exists in abundance, is less apt to have its aesthetic quality destroyed by fractionalization. The concept of melody was left unstructured, for one of the questions for which the answer was sought was whether certain abstract concepts, like melody, whose definition was not precisely formulated, might act as consistent criteria for the same individual, even though other individuals might make their judgments on a totally different concept of melody. It is important to know whether reliable judgments may be obtained when definite standards, other than those based upon Ss' own vague and often unformulated concepts, are not clearly outlined by the experimental instructions.

The precise point of the investigation was to determine whether labelling differs in its effect on judgmental scales according to whether it is general or specific. Previous studies have shown that labelling does enhance the scale values in general; the question is whether this enhancement occurs at all points of the scale.

EXPERIMENTAL PROCEDURE

A preliminary study was made based upon 425 lines of verse selected to give a cross-sectional representation of poetical writing from the time of Shakespeare to the present day poets, and covering the range of melody from high to low. These lines were presented 25 at a time to a class of 16 advanced English students, college men and women, with the same instructions as were given in the main experiment. No labelling was used, and the lines were simply rated on a scale from 1 to 10 on the basis of melody, the definition of which was purposely omitted.

From the ratings given by the preliminary experiment the list of 425 lines was cut to 150 lines, by choosing from each author lines more or less evenly spaced on the scale. The lines thus selected were randomly assigned to three sections so that each would be comparable in average rating and in mean variability and would contain the same number of

lines from every author. The sections thus balanced were labelled a, b, and c, and each section consisted of 50 lines.

The Ss were college men and women, none of whom had participated in the preliminary experiment and all of whom had had from two to four courses in college English. They were divided into three groups, I, II, and III, with 66 Ss to a group; the numbers of men and of women in each group were approximately equal. Although the groups were randomly selected from an alphabetical list of names, as it turned out they were closely equated.

The groups took part in four experimental sessions, in the first three of which they rated one of the sections a, b, or c, consisting of 50 lines; in a fourth session they repeated the ratings of 75 lines (section r), randomly chosen in equal amounts from all three previous sections. The material, together with the instructions, was mimeographed on sheets. Three different labelling conditions were used: A, the line of poetry was presented alone; B, the line was followed by the name of the author; C, the line was followed by the name of the period of literature from which it was taken. In Table I, which shows the experimental design, the upper

TABLE I EXPERIMENTAL DESIGN

Group	1	2	3	4
I	Aa	Bc	Cb	Ar
II	Bb	Bc Ca	Ac	Ar
III	Cc	Ab	Ba	Ar

case letters A, B, and C, stand for the type of labelling; the lower case letters a, b, and c, for the sections of lines; the Roman numerals, I, II, and III, for the groups of Ss; and the arabic numerals, 1, 2, 3, and 4, for the various sessions in order.

Table I shows that Group II, for example, was required to rate in its first experimental session the lines in section b, following each of which was the name of the author (Condition B); in its second session it rated the lines in section a, each of which was followed by the name of the period (Condition C); and in its third session it rated the third group of lines, c, without name of author or period (Condition A); in the final session it rated 75 lines chosen equally from all three sections, under condition A. The counterbalancing in the first three sessions was an attempt to equate differences of order of presentation, of material, and of Ss. The fourth session was for the purpose of determining the reliability of the ratings on a retest.

The following instructions were attached to the mimeographed sheet and were read aloud by E before each session:

The project deals with the evaluation of the melody of isolated lines of verse. It is fully realized that there are serious difficulties involved in any attempt to quantify aesthetic values, especially of elements detached from the contextual whole. Furthermore, no attempt is made to define melody-your own concept of melody will be the criterion you will use in evaluating the material here presented. However, try to avoid incorporating in your meaning concepts based on visual imagery, general excellence of the entire poem, and any other concept that does not pertain to the sheer concept of melody.

You are asked to rate the various lines from a standpoint of melody on a scale from 1 to 10. Thus, if a line is of surpassing beauty so that it is unquestionably among the most melodious lines in the language, give that line a rating of 10, and indicate your judgment by the number 10 placed in the appropriate blank space opposite the end of the line. In like manner 5 would be the rating assigned to a line whose melody yields an average degree of pleasure. All values greater than 5 indicate varying degrees of pleasure derived from the melody of the line. Similarly ratings below 5 indicate less and less degrees of pleasure (or more degrees of unpleasantness) yielded by the line. A rating of 1 indicates a maximum degree of dissatisfaction yielded by the line as regards melody.

At the signal from the experimenter read the indicated line of poetry, mark your rating in the appropriate place, then await the signal for the next line. Avoid concentrating your ratings on a few values for such a procedure would

indicate that you discriminate inadequately.

The time allowed for reading and rating a line was 15 seconds for the first 10 lines in each session, and 12 seconds for each subsequent line. The rate of reading and rating the line was controlled by E. There was a two-day interval between sessions for the first three sessions, and one week between the last two.

RESULTS

Since ratings are so subjective it is of importance to determine whether they yield consistent measures. The average rating given by the group was chosen as the best estimate of the melody of that line. Frequency distributions of the ratings for each line under the three experimental conditions were drawn up, from which the means and standard deviations were computed. Intercorrelations of the mean ratings for all 150 lines under the three experimental conditions are given in Table II. These intercorrelations are high, averaging about .93, indicating that the 198 Ss give a consistent average rating to each line under the three experimental conditions.

A similar finding may be applied to the intercorrelations given by each of the groups of Ss to the same line. When 75 lines were re-rated the correlations given in Table III were obtained; in this table the headings I, II, and III indicate the mean ratings for each line yielded by the

TABLE II

Intercorrelations of Average Ratings Under Each
Experimental Condition

Section	N		Condition	
		A-C	С-В	B-A
a	50	.915	.880	.929
b	50	.953	.933	.938
C	50	.925	.933	.937
Total	150	.928	.889	.913

different groups of Ss; and Ir, IIr, and IIIr indicate the mean re-ratings for the same groups. It is apparent that not only do the different groups rate the same lines consistently, but that the test-retest reliabilities (intercorrelations I-Ir, II-IIr, and III-IIIr) are relatively high.

The intercorrelations so far discussed are based on the mean ratings for every line by the 66 Ss in each group, hence the reliabilities deter-

TABLE III Intercorrelations of Average Ratings Given by Each Group

Group	I	H	111	Ir	IIr
II	.933				
III	.854	.850			
Ir	.930	.910	.814		
Hr	.924	.950	.828	.948	
IIIr	.940	.925	.858	.956	.954

mined are group reliabilities. It would be quite a task to compute the individual reliabilities based on the correlations for each of the 198 Ss on the rating-re-rating of 75 lines. A sample, however, was taken, using the rating-re-rating given by every tenth S in each group, 18 Ss in all. The range of individual reliabilities thus obtained was from .53 to .84, and the mean reliability was .66. It will be recalled that the rating of the 75 lines was done under each of the three experimental conditions, and the re-rating was done under condition A alone. This variation in the experimental conditions under which the lines were rated, together with an habituation effect that will be dealt with later, caused the ratings to vary unevenly, and hence lowered the correlations. Nevertheless, the individual reliabilities are fairly high. On the basis, therefore, of the group reliabilities and the approximate individual reliabilities, it was felt that the measures were satisfactorily consistent.

The correlation technique does not fully indicate how closely ratings assigned by S to any one line are repeated on re-rating. From the sampling of 18 Ss used in the individual correlations, distributions were compiled of the deviations, in either direction, of the re-ratings from the original rating. They are shown in Table IV. It is seen that about two-thirds of

TABLE IV
PERCENTAGE DISTRIBUTION OF DEVIATIONS OF RE-RATINGS
FROM RATINGS

	1					
Deviations	0	1	2	3	4+	Total
Per cent	26.6	39.0	20.5	9.1	4.8	100.0

the re-ratings do not differ by more than one point on the scale from the original ratings; and that only one-seventh differ by more than two points. In view of the fact that Ss would hardly remember many of their original ratings, these findings show that the concept of melody, although unstructured in the experimental directions, is a fairly stable one for the individual, and yields measures that are of adequate reliability, so that some confidence can be placed in the results obtained from their analysis.

It is important to determine whether the three random groups of Ss were actually equated. Table V gives for the three groups, each of 66 Ss.

TABLE V
A COMPARISON OF THE THREE GROUPS OF SS

Section	N	Mean			Standard Deviation		
		I	II	III	I	II	III
Rating a, b, c	150	5.6103	5.6383	5.5666	1.109	1.168	1.109
Rating r	75	5.6349	5.7006	5.5915	1.102	1.166	1.102
Re-rating r	75	5.4095	5.4299	5.4153	1.029	1.068	1.004

the mean ratings and the variabilities for all 150 lines, and the same measures for the 75 lines which were first rated and then re-rated. From these data it is seen that Group II gives the highest ratings, followed by Group I and then Group III. However, the analysis of variance given in Table VII indicates that the differences between the groups do not approach significance; the F value of the differences is only 3.363, whereas an F value of 19.50 is required for the 5 per cent level of significance. For practical purposes the groups may be considered fairly well equated; any minor differences that do obtain are taken care of by the counterbalancing in the experimental design.

The main point investigated was the effect of different types of labelling on judgmental scales of melody of single lines of verse. The dimension chosen for variation was that of specificity of labelling. The labelling of the line probably complicates the aesthetic judgment by adding factors other than those of specificity, e.g. preference based upon familiarity, but specificity is at least one component. To some degree, at least, the appending of the name of the poet to the line makes the labelling specific, and appending the name of the poetic period to the line makes the labelling less specific or more general. A control condition was used by omitting the label from the line.

Since there are no objective measures of melody a subjective measure based upon the group judgment was used, namely, the average rating given to each line of poetry. As there were 150 lines, obviously a scale formed of 150 points would be too unwieldy. It seemed desirable, therefore, to group the lines into deciles of 15 lines each, selected according to their rating under condition A, that is, without any label. After computing the average rating for condition A per decile, the changes in average rating under general labelling and specific labelling were deter-

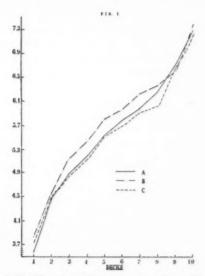


FIG. 1. THE EFFECT OF LABELLING UPON SCALE VALUES.

Condition A-Control condition, no labelling.

Condition B-Line with the name of the author appended.

Condition C-Line with the name of the poetic period appended.

The abscissae are the deciles arranged according to mean rating under Condition A. The ordinates are the mean ratings per decile.

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mined. Fig. 1 shows the mean rating for each decile arranged from high to low on the scale. It is seen that the assigning of a specific label enhances the rating values chiefly in the centre of the scale, while a general label has little effect on the rating—if anything, it tends to lower it. The fact that the extreme values are relatively little changed will be discussed later.

More precise information on the effect of labelling is yielded by Table VI which gives the average values of the ratings under every

TABLE VI AVERAGE RATING VALUES UNDER DIFFERENT LABELLING

Group	N	A	B	C	Total
I	66	5.7270	5.6445	5.4597	5.6103
II	66	5.4636	5.8124	5.6688	5.6383
III	66	5.5097	5.7297	5.4603	5.5666
Total	198	5.5666	5.7288	5.5288	5.6081

experimental condition. Each cell in the table, except those for the totals, is the mean of the ratings of 50 lines by 66 Ss. The variabilities were also computed but they are not tabulated; they averaged about 1.0 per cell.

An analysis of variance was computed and the results are given in Table VII. It is seen that the experimental methods show a variation that is significant slightly beyond the 5 per cent level, that the variation

TABLE VII
ANALYSIS OF VARIANCE OF RESULTS

Variable	F Values	Levels of Significance				
Groups of Ss	3.363	19.50 for 5% level				
Methods	22.595	44 44 44				
Order of Sessions	5.427	44 44 44				
Material (Sections)	17.627	46 46 46				
Interactions						
Groups X Methods	12.063	5.63 for 5%; 13.46 for 1% level				
Order X Methods	11.031					
Sections X Methods	4.932	11 11 11 11 11 11 11				

in materials in each of the sections does not reach this level of significance, and that the effects of the order of presentation and of the groups of Ss are not significant. The significance of the interaction between groups and methods, and order of presentation (experimental session) and methods is rather high; that between contents and methods is negligible. On the basis therefore of these findings it may be concluded that specific labelling tends to enhance the scale values, whereas general labelling, if it has any effect, tends to lower them. Owing to the anchoring of the scale at the extremes the terminal ratings are not greatly changed.

HABITUATION EFFECTS

An incidental question of some interest is the determination of the habituation effect as a result of repeated rating. While it is obvious that the mean ratings and the variabilities tend to become smaller with practice, as may be seen in Table V, a more searching analysis was made to determine the habituation effect at different points on the scale. The 75 lines which were rated under three experimental conditions and then rerated were divided into quintiles of 15, and the mean rating was obtained for each quintile of the initial session; corresponding values for the quintiles were obtained for the three other sessions. The results are shown in Fig. 2. The high rating values tend to become progressively lower with

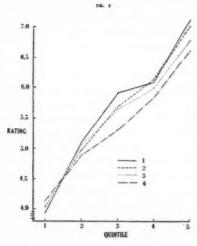


Fig. 2. The Habituation Effect.

The abscissae are the various quintiles

in order for condition A.

The ordinates are the mean ratings per quintile.

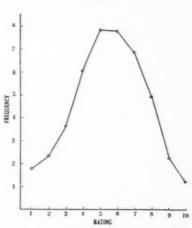


Fig. 3. Frequency Distributions for Ratings at Every Scale Point. The ordinate scale is the frequency in thousands.

practice, and the reverse holds for the lowest values. Thus habituation causes, not a diminution of rating, but a regression to some intermediate value. In other terms, there is, with practice, a tendency for the ratings

to approach an adaptation level in the sense used by Helson (2). This point is of theoretical interest, for it indicates the presence in aesthetic judgments of some kind of adaptation effect previously found in perceptual judgments.

DISTRIBUTION OF JUDGMENTS

Frequency distributions of the ratings were compiled to see whether preferences occur at any point on the scale from 1 to 10. Since the distributions for all conditions corresponding to each cell in Table I were so similar, they were pooled to give a general distribution of 44,550 judgments, which appears in Fig. 3. It is obvious that no round number preference occurs and that there are almost equal numbers of central judgments of 5 and 6; this finding is not unexpected since the midpoint of the scale used was 5.5. There is a greater tendency to give ratings 1 and 2 than 9 or 10; i.e., more ratings of "very unsatisfactory" than of "highly satisfactory" occur. Decidedly more ratings are given to 7 and 8 than to 4 and 3. In other terms, the great bulk of the ratings are given near the mean; if displaced slightly from the mean they are prone to be high ratings rather than low ratings; but if they are extreme ratings they are more prone to be low than high. S is generous in his rating of a fairly melodious line, but is quite critical of the most unsatisfactory lines.

DISCUSSION

When Ss of the preliminary investigation were asked on what basis they made their judgments they found difficulty in defining melody. As might be expected a number of factors entered into this definition: perceptual factors, such as the sound of the line, alliteration, smoothness of vowels, etc., were most frequently named, but they are far from exhausting the actual concept. Familiarity did enhance the value of the most melodious lines, and may have had a contrary effect on the least melodious lines. The general hedonic tone as evoked by the remembered context, and the imagery, chiefly visual, had a facilitating effect. Several references were made to other unusual components of melody as it existed for the individual rater. The result was that often there was a fairly wide dispersion of the ratings assigned by the group to any one line, which is probably to be expected from such subjective material. Tastes differ so widely that there is no standard rating for any line, except the average rating of a representative group. In spite of the fact that the definition of melody was left unstructured by the instructions, Ss' ratings are selfconsistent, and the average rating of the group is still more consistent. The reliabilities of the group judgment tend to approach the reliabilities of our most objective measures, so that manipulation of these measures may be carried out with some confidence.

Not only are these measures of adequate reliability but they may be formed into a scale having the same attributes as scales compiled from more objective material. There were no clear objective standards to serve as anchoring points, yet terminal anchors were formed by the instructions how to rate points 1 and 10 on the scale. Absolute standards based upon general impression from past experience, rather than relative standards, determined the anchoring points. Their impact may be seen from the fact that labelling, whether general or specific, produces little or no change at the extremes of the scale which were anchored, but does produce its maximum effect away from these anchors. From the distribution curve, Fig. 3, one infers that the lower terminal anchor was more effective than the upper one, for it attracted more ratings to the lower end of the scale.

The habituation effect is a point of theoretical interest which emerges from the study. Since all aesthetic material is a potential source of hedonic tone, and since the experimental instructions induced an hedonic set to the judgment, it is possible that the habituation found in this study may be partly due to hedonic habituation (1). Because, however, Ss tended to stress perceptual factors in their concept of melody the explanation for habituation is probably one that is common to perception and to judgment. It seems more plausible to conclude that repeated judgments on aesthetic material tend to approach an adaptation level, just as do per-

ceptual judgments.

Furthermore, an extension of this concept casts light upon the effects of labelling. Helson (2) has shown that in judgments of brightness the adaptation level is considerably affected by the background level of illumination. If judgments of verbal and aesthetic material are similarly prone to seek an adaptation level, one would expect this level to be affected by the background, i.e., the resultant of previous experiences with the same type of material. This is precisely what Woodworth and Sells (3) have found in their studies of the atmosphere effect. Labelling tends to emphasize the general experiential background, so that when labelling is specific the judgmental scale is shifted. On the other hand, general labelling has little or no effect on the judgmental scale, possibly because it is too diffuse and fails to bring the background of experience into sharp focus.

The effects of habituation are slight, and show a maximal change of about 5 per cent over four long sessions. For that matter, too, the effect of labelling is only of the order of 5 per cent. It is doubtful if these effects would have emerged had not the measures been so reliable and had care not been taken to counterbalance all conditions. Because of the ease with which it may be gathered, and the speed with which it may be rated, aesthetic material of this type lends itself, at least as well as does perceptual material, to investigations of judgmental scales.

SUMMARY

In a study of the effect of labelling a line of poetry with the name of the author or of the period, using 198 Ss and 150 lines of verse, the following were the findings:

(1) Although the definition of melody was left unstructured, the testretest reliabilities are high, and the individual reliabilities are moderately so.

(2) Terminal anchors for the judgmental scales, possibly due to the instructional set, were formed.

(3) Appending the name of the author enhanced all scale values except at the anchors; the name of the poetic period had little or no effect on the scale.

(4) A frequency distribution of all judgments showed no round number preference for any scale values.

(5) An habituation effect, resulting from four experimental sessions, was found, whereby the scale values tended to regress to some intermediate level.

(6) An explanation of the habituation effect, and the result of labelling, based upon Helson's adaptation theory, is advanced.

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PSYCHOLOGICAL FACTORS IN INDUSTRIAL ORGANIZATION AFFECTING EMPLOYEE STABILITY¹

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This study represents an attempt to investigate the validity of the following hypothesis:

The manner in which work is organized in modern industrial settings has resulted in certain working conditions which contribute in varying degrees to instability of the working behaviour of employees. The inference is that differences in working conditions such as affect communication and teamwork among employees and their opportunities for personal recognition and identification will be reflected in differential rates of labour turnover and absenteeism.

Starting with objectively determined differences in labour turnover and absenteeism among various organizational divisions of a manufacturing plant, working conditions in these divisions are analyzed in order to make the discovered differences intelligible in terms of psychological factors related to work satisfaction.

Early researches, notably the early phases of the "Hawthorne Experiments" (7, 9, 11, 14, and 15) were designed primarily to test physiological fatigue hypothesis in repetitive industrial work. The results being mostly negative, later investigations were aimed to discover psychological implications of industrial work situations. The general outcome of the Hawthorne researches indicated that effective work performance and satisfying work experience on the part of employees were dependent not merely on financial reward, desirable circumstances regarding hours, physically comfortable working conditions, and health benefits, but particularly upon certain inter-personal relationships in the work setting. Elton Mayo's early independent study (8) of the mule-spinning department in a textile mill stressed the beneficial results which appeared to accrue from physical relaxation. Re-interpreting his findings later, Mayo suggested that the rest periods introduced also brought about a significant change in the inter-personal relationships among the workers. A study reported by Mayo and Lombard (10) indicates a high relationship between labour turnover and extent of teamwork which occurred in work situations of certain aircraft industries in California.

The hypothesis of the present study has a bearing on certain trends which have occurred in industry. The Industrial Revolution and subse-

¹This article represents a summary of a Ph.D. thesis based on a research project which the writer undertook as a graduate student in the Department of Psychology on a fellowship with the Institute of Industrial Relations, University of Toronto. The writer wishes to acknowledge particularly the helpful guidance and interest of Professor W. Line.

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quent developments have resulted in rapid expansion of the means of production. In the process of expansion, changes in production methods together with increase in the size of factories in terms of numbers of employees have resulted in changes in the organization of the work. Many of these changes have been made in accordance with the so-called principles of scientific management. The basis of these principles is division of labour with emphasis on the individual contribution of employees in terms of individual effort. Our hypothesis implies that this manner of organizing the work, with its emphasis on individual rather than joint contributions, results in the worker losing perspective. Being out of touch with fellow-workers he finds it difficult to see meaning in his effort.

THE SETTING

The data for the study were obtained chiefly from a wire and cable manufacturing company located in the vicinity of Toronto. The company employed approximately 1800 workers at the time and was considered to be a large organization by Canadian standards. Organizationally, it followed the pattern set by modern industry. This pattern, developed partly as a result of increasing scope of operations, consists of dividing the total production effort into various stages of operation. Thus the production organization consisted of twenty-nine departments each having a specialized function in the total process.

PROCEDURE

Generally speaking, the procedure of the study was to examine all areas of the organization for the purpose of discovering psychological factors related to extent of labour turnover and absenteeism. Indices of labour turnover and absenteeism calculated over a twelve-month period were obtained for all twenty-nine departments. In view of the fact that departmental variations in labour turnover were found to correspond substantially to variations in absenteeism, (rank order $= +.667 \pm .073$), subsequent analysis was confined primarily to examining the relationship of a number of variables with labour turnover.

Average age of employees in the various departments, marital status, number of dependents, educational level, and extent of earnings were not found to have a significant statistical relationship to extent of labour turnover. This also applied to size of department (in terms of number of employees) and the following job factors: mentality (intelligence), skill, mental application, and working conditions, as measured by the company's job evaluation system. However, the job evaluation factor of "responsibility" was found to correlate significantly with extent of labour turnover (rank order = $-.538\pm.93$).

Subsequent to this analysis the labour turnover of production departments was compared with that of the service departments. The production-service classification is an organizational break-down formally observed in the company records. Production departments, as their classification implies, are solely concerned with production; service departments are various work units which assist in mechanical and other maintenance functions related to the production departments. They keep the production departments supplied with materials, receive, store, and ship materials, etc. This specialization of function is the outcome of modern principles of scientific management. The emphasis is on division of labour, making each production unit responsible for a specific type or phase of manufacturing. Among other things this specialization of work results in differences in scope of operations. Employees in service departments, although limited in terms of function, tend to circulate in various areas of the plant wherever and whenever required. Production employees, on the other hand, are always confined to a particular scene of operations.

Table I indicates the percentages of labour turnover of production

TABLE I

Comparison of the Total Percentages of Labour Turnover in 14 Production and 15 Service Departments in a Twelve-Month Period

	Production Departments	Service Departments	Totals
Average Number Employed	818.38	410.06	1228.44
Number of Terminations	612.	190.	802.
Per cent Labour Turnover	74.78	46.33	65.29
σ	1.518	2.462	
σDp	2.184		
D	28.35		
$D/\sigma Dp$	12.98		

and service departments for comparative purposes. The difference of 28.35 per cent is statistically highly significant. Comparable data from three additional manufacturing plants indicated similar differences. Similarly significant differences in rates of absenteeism for the year were obtained, service departments showing decidedly lower rates.

In view of the foregoing results the study was focussed on production departments. The first procedure was to obtain a measure of labour turnover for each occupational classification, that is, for each job, in each of the fourteen production departments. To facilitate this analysis, the work activity in each of the production departments was examined and described and thus further information obtained about the situations in which differences in labour turnover occurred.

It was observed that there were two major types of occupations,

"machine operating" and "non-machine operating." Machine operators, as their classification implies, are chiefly responsible for operating the equipment to which they have been assigned. Often their machines are "set up" or prepared by others. They bring their machines into operation, closely observing the product to insure uniform production. In case of breakage of threads or wires they do the required mending. They also make minor adjustments to the machines. Apart from lunch-hour shut down, trips to the wash-room, or stoppage for repair to their equipment, the operators are closely confined to their machines. Members of production departments whom we have classified as non-machine operators have a variety of functions. Some prepare or set up machines for operators, others oil the machines, supply operators with materials, etc. Generally speaking they perform a sort of service function for the operators and the varied nature of their duties naturally permits considerable mobility within the area of their departments.

TABLE II

Comparison of Labour Turnover of "Machine Operators"

AND ALL "Non-machine Operators" in

PRODUCTION DEPARTMENTS

	"Machine Operators"	"Non-machine Operators"
Number Employed	530	319
Number of Terminations	414	167
Per cent of Labour Turnover	78.11	52.35
σ	1.795	2.795
σDp	2.46	
D	25.76	
D/gDp	10.47	

Table II indicates that the labour turnover of machine operators is significantly higher than that of non-machine operators. Analysis of financial remuneration of these two groups indicated that this difference could hardly be attributed to earnings; in fact the earnings of machine operators were somewhat higher.

The possible influence of a further variable in production departments—namely, the influence of noise—was examined. In some departments the noise was so great that conversation was difficult. Each of the fourteen departments was therefore rated jointly by the author and a competent company official in regard to the extent to which noise permits or prohibits conversation. The results of this analysis are presented in Table III. The labour turnover of departments in which noise makes conversation difficult is significantly higher than that of departments in which noise does not deter conversation.

(1)

TABLE III

COMPARISON OF LABOUR TURNOVER OF DEPARTMENTS
ASSIGNED TO THREE NOISE CATEGORIES

	No. of Departments	Average No. Employed	No. of Terminations	Labour Turnover
Depts. in which extent of noise makes conversation difficult	4	341.93	291	85.11
Depts. in which extent of noise produces a medium range of difficulty of con- versation	3	183.26	152	82.94
 Depts. in which extent of noise does not appear to be a factor in possibility of conversation 	7	293.19	169	57.64

INTERPRETATION OF RESULTS

1. (a) Recent researches reported in the literature would lend weight to the explanation of differences in working regularity resulting from the influence of foremen and supervisors. Mayo and Lombard (10, p. 2) indicate that their research findings point to "the methods of first-line supervision as of critical importance to the control of absenteeism and labour turnover." The Hawthorne researches (7, 9, 11, 14, and 15) indicate the importance of the role of the supervisor in determining morale of employees. While the influence of supervision cannot be denied in the setting which has been studied here, evidence suggests that this influence does not account for the differences in labour turnover and absenteeism between service and production departments. In the first place, the data from all four companies investigated indicated similar differences, and it is highly improbable that a general difference in the effectiveness of supervision exists in all four situations. Secondly, examination of the labour turnover within production departments has indicated that machine operators within these departments have a higher incidence of turnover than other classifications of employees in the same departments. Within each department, machine operators and non-machine operators are influenced by the same foreman and supervisor. In other words, supervision appears to represent a constant variable in production departments.

(b) It is widely accepted that general employment conditions influence labour turnover in industry. Under conditions of labour scarcity and shifting demand for labour, overall labour turnover usually increases. It is conceivable that the general labour turnover of the four plants studied was affected by certain conditions prevailing during the time of the study. It is also possible that general conditions, whatever they may be, could have been responsible for differential rates of turnover in the settings investigated. Employees in production departments might conceivably have found it easier than employees in service departments to find employment elsewhere when the demand for labour was high. The validity of this interpretation could only be demonstrated by detailed study of the relationship of occupational labour turnover to the prevailing demand for labour. While possibility of some influence of external conditions is suggested here, our interpretation of the present findings tends to favour the significance of internal variables, that is, conditions within the organization.

(c) Another possible interpretation of the differential rates of labour turnover is that workers with different personality characteristics gravitate either to production or to service types of work. In spite of the findings that labour turnover did not correlate significantly with personal data such as age, education, etc., the validity or otherwise of this interpretation is difficult to establish within the limits of the present study. Further research into the work history of both production and service employees is warranted in this area.

2. Although the interpretations outlined above cannot be ruled out at the present stage of our knowledge, it seems justifiable to interpret our findings in terms of psychological factors related to variations in work organization. This interpretation is as follows:

(a) As stated above, employees in service departments, engaged in a variety of activities such as repairing and maintaining equipment, handling materials, and keeping the plant clean, have a service function mainly related to the entire plant. It is suggested that it is not difficult for individuals performing these functions to see themselves as having tangible day-to-day usefulness to fellow employees in production departments. The nature of service occupations is also such that, in general, their activities permit a relatively high degree of mobility within the plant. Mobility here is defined as movement within the plant area. Thus, the service function, because it necessitates discussion of current maintenance problems, etc., in the various areas of the plant, results in a good deal of personal contact. On the other hand, the activities of production department employees are confined to their various production areas.

Being relatively more mobile within the total plant area and apparently having more tangible evidence of usefulness to fellow workers, service department employees have greater opportunity for obtaining recognition of their efforts than production employees. Owing to the division of labour in the plant, each production department is responsible for only a fraction of the total production effort. In other words, the con-

tribution of production employees is partial rather than whole. It is suggested that since they lack mobility and personal contact with others who are part of the production team, they find it relatively difficult to obtain recognition and a sense of participation.

This interpretation of the particular results of the present study appears to receive support from research findings and interpretations as reported in the literature. Some of these have already been referred to. T. N. Whitehead (15, p. 54) writes about the adjustment which came within the relay test group under experimental changes of the Hawthorne researches. When the members of the group were permitted to associate freely among themselves and when they began to realize that they were participating in a project which they as well as others regarded as important, they made a satisfactory adjustment. Their production output increased, their labour turnover and absenteeism became almost negligible, and the workers themselves indicated that they had achieved satisfaction in their work. As far as freedom of association was concerned, one of their former difficulties-lack of freedom to converse with one anotherhad been eliminated in the experimental situation. In writing about this group, Mayo (9, p. 72) suggests that the "individuals became a team and the team gave itself wholeheartedly and spontaneously to cooperation in the experiment." Mayo goes on to say that "the organization of working teams and the free participation of such teams in the task and purpose of the organization as it directly affects them in their daily rounds" deserves close attention.

On the basis of evidence which he presents, Whitehead suggests that one of the main social problems of industry is that "the immediate social routine activities are too few or unsatisfying" (15, p. 95).

G. W. Allport has suggested (5, p. 258) that "the individual's desire for personal status is apparently insatiable. Whether we say that he longs for prestige, for self-respect, autonomy, or self-regard, a dynamic factor of this order is apparently the strongest of his drives." In the same article Allport goes on to say that when the individual is busily engaged in using his talents, understanding his work, and has a free and easy relationship with foreman and fellow workers, then he is "identified" with his work. He is "ego-involved," "participant." He suggests that when this process does not occur the "job-satisfaction" is low. "When the ego is not sufficiently engaged the individual becomes reactive." He finds outlets in complaints, strikes, etc. Our interpretation here, in Allport's frame of reference, is that production department employees, not having adequate opportunities of becoming ego-involved in their situation, become reactive; they absent themselves more frequently and terminate their employment more readily.

(b) Another aspect in which production and service functions appear to differ is related to opportunity of exercising personal control of work

effort. Service employees are able to plan and vary their activities to a greater extent. The primary emphasis in their function is on *quality*. The activities of production employees, on the other hand, being more routine and in accordance with schedules, etc., emphasize quantity rather than quality of performance.

Again, in accordance with Allport's theory of personality needs, it seems entirely possible that this restriction in work function, brought about by the emphasis on quantity of work, produces loss of self-respect or self-regard on the part of production employees. Participation has been restricted to a narrow field of operations by the division of labour; that

is, by the manner in which the work has been organized.

Labour Turnover Differences between Machine Operators and Non-Machine Operators within Production Departments. The results of the analysis of labour turnover within production departments have established that the relatively high labour turnover occurring in these departments stems largely from machine-operating occupations. It was further established that machine operators, because of the nature of their work, are relatively confined to limited areas. Contrastingly, non-machine operators have a relatively high degree of freedom of movement within their department. At the same time the extent of noise in some of the departments was found to be such as to make conversation difficult. This particularly affected machine operators in these departments because of their proximity to the source of the noise.

It is suggested that the factors responsible for the difference in extent of labour turnover between machine operators and non-machine operators are very similar to those responsible for the production-service labour turnover differential. These findings tend to substantiate the results and the interpretation of obtained production-service differences. Non-machine operations are fairly comparable to service occupations. The machine-operating individuals in the production departments appear to lack adequate opportunity of integrating themselves with other members of the production group. If Allport's theory that a balanced personality needs deep-rooted participation has validity, machine operating in this particular setting does not afford opportunity to meet the need. Our interpretation here again is that under conditions of lack of opportunity to satisfy the social or psychological needs, the individual becomes frustrated, he becomes dissatisfied with the work situation and tends to withdraw. The manner in which the work schedule has been laid out for him does not meet the conditions of psychologically satisfying work experience.

The data which establish that there is a relationship between production department labour turnover and extent of noise in terms of conversation possibilities appear to support the interpretation. The Hawthorne relay test group tended to lose its social rigidity when conversation was

freely permitted. Conversation, or communication generally, serves as a medium through which the worker becomes identified with other members of the work group. It serves the purpose of permitting him to become aware of his function, his participation in the work being done.

Responsibility. The examination of the influence of a number of variables in all twenty-nine departments has revealed that variations in extent of labour turnover corresponded rather closely to variations in extent of "responsibility" as defined by job evaluation in the setting. Although "responsibility" was rather narrowly defined as "the extent of coordination and alertness required where the relative chance of error is great and its probable cost high," this finding would appear to be significant to our interpretation of the general results of the study. Douglas McGregor (5, p. 49) has suggested that "a corollary of the desire for participation is a desire for responsibility." Employees in both service and production departments performing functions which the company regards as having relatively higher "responsibility," may have a greater awareness of their participating role. In being called upon to make decisions, to solve problems which are recognized as having importance, they obtain a measure of self-regard which results in personal satisfaction, and in stability of employment.

SUMMARY

By way of examining the validity of the hypothesis that the manner in which work is organized in present-day industrial settings is conducive to employment instability through lack of work satisfaction on the part of employees, the present study includes: (a) a detailed demonstration of a number of differences in labour turnover and absenteeism among organizational divisions in the same industrial plant; (b) an attempt to interpret these differences in terms of psychological factors related to work satisfaction.

Interpretation of evidence implies making inferences from obtained data, and where, as here, these inferences involve psychological conditions not directly investigated, alternative interpretations cannot be finally excluded. Certain of the latter have been critically examined but it is possible that further research pertaining to some of the numerous variables operating in the situation may disclose additional explanatory factors.

However, on the basis of the facts at hand, it is the conclusion of the investigator that the interpretation suggested in this study is acceptable, because it renders the varied findings of the study intelligible, and because it is congruent with our present psychological knowledge and is supported by recent research in industrial psychology. Accepting this interpretation, it is concluded that the greater employment instability among production employees, and particularly among machine operators, is a function of the following conditions:

1. Their work is highly specialized; they have little mobility and opportunity of communicating with other members of the production staff.

As a result, their opportunity of obtaining social recognition of their contribution is reduced, particularly in its qualitative aspects.

3. They are thus less likely to become identified or ego-involved with other members of the work group or with the work as such.

4. Their work satisfaction is therefore low and they tend to absent themselves more frequently and terminate their employment more readily.

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BOOK REVIEW

Fundamental Statistics in Psychology and Education. By J. P. GUILFORD. Toronto: McGraw-Hill Book Co., 2nd edition, 1950. Pp. 633. \$5.80. Psychological Statistics. By Quinn McNemar. Toronto: University of Toronto Press (New York: Wiley), 1949, Pp. 364, \$5.40.

Statistical Methods in Research. By PALMER O. JOHNSON. Toronto: General Publishing Co. (New York: Prentice-Hall), 1949. Pp. 377.

THESE three books represent attempts by their respective authors to incorporate within the framework of a textbook on statistics some of the recent developments in statistical theory and practice. At this point

their similarity ends.

The roles which these texts will serve in the curriculum of a department of psychology are markedly different. Guilford's Fundamental Statistics in Psychology and Education is intended to serve not only as an introductory text but also as a handbook. It may well be that the author by attempting to serve this latter end may in some degree have defeated the former. Clearly, the book contains more material than can be covered conveniently in an introductory course. Nevertheless, it is arranged excellently and sections can be omitted conveniently without interfering with the continuity of instruction. This book is an extensive revision of the earlier edition which is well known. While the earlier edition was roundly criticized for a number of technical defects, it was, in my opinion, well regarded by students as a text for its simple and straightforward exposition. This is no small virtue. The second edition corrects many defects of the original, while still preserving many of its commendable qualities.

McNemar's Psychological Statistics is intended for use as a text for a year's course in introductory psychological statistics. My impression is that it is not altogether adequate for this purpose, and could be used to better advantage after the student has received some acclimatization to elementary statistical concepts. McNemar's transition from the elementary problem of describing the properties of univariate frequency distributions to the theory of sampling and statistical inference is indeed very rapid. This characteristic, which in certain situations may prove a defect, turns out in our use of the book at McGill to be an asset. Our practice here is to give an introductory half course in psychological statistics to students in their second or third year. This is followed by a second full course at the graduate level for all graduate students. McNemar's book has been used for this second full course and has been found to serve our purpose most admirably. I should hesitate to recommend its use in an introductory course where the level of arithmetical and algebraic sophistication of many students leaves much to be desired.

Palmer Johnson's Statistical Methods in Research is more highly

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specialized, is intended as an advanced text, and is concerned largely with sampling theory, analysis of variance and covariance, the principles of experimentation, and related matters. This book brings together much that is recent in statistical methodology, and provides an excellent source of information which hitherto could not be conveniently come by without consulting the original papers. It will find its place as a reference book for graduate students or as a text in a specialized course.

Having evaluated the role which each of these books will fill in the teaching programme of a psychology department, some specific comments may be advanced with respect to their content. Guilford in his revision of Fundamental Statistics in Psychology and Education has added much new material including a detailed treatment of small sampling statistics and an introduction to the analysis of variance, topics which were handled inadequately in the earlier edition. The book contains material on test scaling procedures, test reliability theory, test validity, and other information which is unique to the field of psychological measurement. It has a more specific psychological orientation than either of the other books.

Guilford's book is more in conformity with the traditions of a psychological statistics text. Criticisms may be advanced against it on the grounds that more space should be devoted to analysis of variance techniques, design of experiments, and some of the more recently developed statistical methods. There are, however, many teachers of introductory statistics who have been educated in the older and in many cases still quite serviceable methods, and have not attained a high degree of sophistication in some of the more recently developed techniques. This book will be welcomed by them and others not only as a text book but as a compendium of useful information.

The question may be raised legitimately here as to the stage at which the student should be introduced to analysis of variance and covariance techniques. Guilford is clearly of the opinion that the student should receive only an elementary introduction to the analysis of variance in the introductory course. McNemar and Johnson would probably argue that the student should be introduced to the analysis of variance at an earlier stage of his instruction, and that many problems handled by the more traditional methods should be treated early on by analysis of variance techniques. This question, in my opinion, is an open one, and in practice must be left to the preference of the individual instructor.

Opinions with respect to what constitutes omissions in texts written to meet some general requirement will differ markedly, depending on the particular interests of the individual. My comments with respect to what has been left out by McNemar cannot therefore be construed to be in the nature of criticism, but reflect merely my own opinions on the matter. First, in NcNemar's book some consideration of the classes of statistical variables found in psychological work, and a discussion of the appropriateness of various statistical methods in handling each class of variable would have been a useful addition. The classification of variables suggested by S. S. Stevens as nominal, ordinal, interval, ratio variables has a useful place in statistical thinking. Second, a lengthier and more sophisticated handling of probability theory would have been an advantage in the situation in which McNemar's book is used by us. Some awareness of probability and a passing acquaintance with the more frequently discussed theories (including that of Von Mises) tends to disperse much of the mystery which frequently resides in minds of students with regard to the probability concept. Upon this concept, whether it be a rock or a shifting sand, much of the edifice of statistical methodology is built. Third, a more up-to-date treatment of rank order correlation would have been welcome. McNemar devotes slightly over a page to rank order correlation. Many of the variables which concern psychologists are of the ordinal type; consequently a consideration of methods appropriate to the handling of such variables is essential in any text of psychological statistics. In recent years very considerable work has been done in this area, new methods of rank order correlation developed, the sampling distributions of indices of rank order correlation more fully studied, and in general the whole field of rank correlation methods re-explored with many useful results. Much of this work has been done by British statisticians including M. G. Kendall. H. E. Daniels, and J. W. Whitfield, and is of considerable interest to psychologists. Fourth, in McNemar's discussion of the analysis of variance, no mention is made of the case where the data have been classified on the basis of two or more criteria with unequal or disproportionate numbers of observations in the sub-classes. Psychological investigation involving double classification with unequal or disproportionate numbers of cases in the sub-classes occurs frequently in psychological work, and a knowledge of the method for handling such data is of importance to the psychologist. This problem has been studied by Fei Tsao who has developed methods which appear to be acceptable. In general, however, McNemar's handling of the analysis of variance is without doubt the most lucid and understandable exposition of the subject I have read to date in any psychological statistics text. Fifth, some consideration of an exact test of significance for a 2 x 2 bivariate table would have been of interest to psychologists who are engaged in investigations involving small numbers of cases. The above list of topics must not be construed as criticism of McNemar's book. Rather, I should prefer to have them regarded as suggested possible additions when McNemar produces a revised edition.

Palmer Johnson's book is intended to serve a purpose different from that of McNemar's, and for that reason I do not propose to comment on what might be regarded as its omissions. Johnson emphasizes the effectiveness of a statistical method for a particular purpose, the assumption underlying the methods used, and procedures for testing whether these assumptions are satisfied in the particular case. These are admirable points of emphasis, particularly in the psychological field where the assumptions underlying our methods are in many instances not satisfied in practice; yet we continue to act as if they were and hope for the best.

While recognizing fully the merit of this orientation in Johnson's book, the fact, however, that the assumptions underlying a method are not satisfied, is not clearly in all cases a justification for its rejection. In the field of applied statistics we are not infrequently in a situation where our assumptions are known not to be satisfied in some degree. The problem then arises as to the way and the extent to which the inferences we might otherwise have drawn are circumscribed. Johnson emphasizes the issue: are our assumptions satisfied? I should like to emphasize the further issue: when our assumptions are not satisfied, a situation which frequently occurs in practice, how will this affect the conclusions which might properly be drawn from the data? In many instances statisticians at present cannot provide rigorous answers to this latter question, but must rely on their general experience and intuition to guide them. It is probable that as time goes on an increasing body of information will become available on the consequences of the failure of the properties of data to conform to the properties of statistical models.

Some of the chapters of Johnson's book are expositions in which the rationale underlying many statistical recipes is elaborated. Other chapters are of the cookery book type in which the steps to follow in the jugging of a miscellany of statistical hares are outlined in detail, step by step, with illustrative examples. The expository chapters are lucid and informative. In many instances, however, I found that they aroused my interest and whetted my appetite for more, but were not sufficiently comprehensive to satisfy that appetite completely. This may be a merit rather than a defect of the book.

In so far as any of these books may be said to have defects, such defects are greatly outbalanced by their achievements. Most authors of textbooks on the completion of their work must feel a compulsion to purge their souls by delivering themselves of the invocation in the confession, "Almighty and most merciful Father . . . We have left undone those things which we ought to have done, and we have done those things which we ought not to have done, and there is no health in us." With regard to sins of omission and commission these authors have erred less than most. Let their minds be at peace.

GEORGE A. FERGUSON

CANADIAN THESES IN PSYCHOLOGY, 1950

(The following abbreviations are used: Alberta—University of Alberta Library; U.B.C.—Library, University of British Columbia; Laval—Bibliothèque de l'Ecole de Pédagogie et d'Orientation, Université Laval; McGill—The Redpath Library, McGill University; Ottawa—The Library, University of Ottawa; U. of T.—The Psychology Library, University of Toronto; Western—University of Western Ontario Library.)

- AGNEW, J. N. "A study of attitudes toward mental illness." M.A. Thesis, University of Toronto, 1950. Pp. 49, MS. (U. of T.).
- AINSWORTH, L. H. "Rigidity as a manifestation of insecurity." M.A. Thesis, University of Toronto, 1950. Pp. 66, MS. (U. of T.).
- ALDERDICE, E. T. "An analysis of error performance on a test for abstract reasoning."
 M.A. Thesis, University of Toronto, 1950. Pp. 56, MS. (U. of T.).
- ALLEN, MADGE E. "An investigation of the performance of a group of normals and a group of mental hospital patients on the M-W drawing test." M.A. Thesis, University of Toronto, 1950. Pp. 29, MS. (U. of T.).
- Alphonse-Félix, mariste Frère. "Intelligence-succès scolaires-assiduité." Thèse de Licence en Pédagogie, Université Laval, 1950. Pp. 124, MS. (Laval).
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- BEATY, MARJORIE J. "A study of the intellectual ability and vocational fitness of a group of 17 boys of sub-normal intelligence." M.A. Thesis, University of Western Ontario, 1950. Pp. 59, MS. (Western).
- Bexton, William Harold. "The use of motor skills tests with the blind: an appraisal of methods of adaptation and administration." M.A. Thesis, University of Saskatchewan, 1950. Pp. vii + 70, MS. (University Library, University of Saskatchewan).
- BLEWETT, DUNCAN B. "A comparison of certain measures of interest in Armed Service trades selection." M.A. Thesis, The University of British Columbia, 1950. Pp. 64, MS. (U. B. C.).
- Blum, Mary R. "Studies in Security, No. 10: Security of adolescents in their use of money." M.A. Thesis, University of Toronto, 1950. Pp. 77, MS. (U. of T.).
- Brawn, Clarence E. "The validation of a morale scale." M.A. Thesis, University of Western Ontario, 1950. Pp. 41, MS. (Western).
- Brougham, N. I. "Emotional patterns in skin disease." M.A. Thesis, McGill University, 1950. Pp. 25, MS. (McGill).
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- Brown, J. M. "An examination of flying training assessment methods in the RCAF." M.A. Thesis, University of Toronto, 1950. Pp. 38, MS. (U. of T.).
- BRYAN, J. R. "A study of personality adjustment differences of delinquent and non-delinquent groups as measured by the Bell Adjustment Inventory and the California Test of Personality." M.A. Thesis, University of Toronto, 1950. Pp. 35, MS. (U. of T.).
- BURD, F. W. "A further investigation of the relative order of the attainment of concepts." M.A. Thesis, University of Toronto, 1950. Pp. 77, MS. (U. of T.).
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- CHÉNÉ, MME HUBERT. "L'enseignement correctif comme technique de psychothérapie." Thèse de Licence en Pédagogie, Université Laval, 1950. Pp. 101, MS. (Laval).
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- CRAIG, WILLIAM JOHN. "An experiment in code-typing: transfer of training in the integration of two complex skills." M.A. Thesis, Queen's University, 1950. Pp. viii + 118, MS. (Douglas Library, Queen's University).
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- MACNEIL, VINCENT ALFRED. "Relationship between scores obtained by Bennett and Bernreuter systems of scoring Bernreuter Inventory." M.Ed. Thesis, Alberta University, 1950. Pp. 25, MS. (Alberta).
- MARTIN, JANET ISABELL. "Predicting success of education students in academic courses and in teaching." M.Ed. Thesis, Alberta University, 1950. Pp. 57, MS. (Alberta).
- MATLOW, JEAN. "To study a battery of tests applied to enlisting RCAF ground personnel." M.A. Thesis, University of Toronto, 1950. Pp. 37, MS. (U. of T.).
- MEHMEL, VINCENT. "The role of personality factors in structuring small groups."

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- MILNER, P. M. "A study of the mode of development of food preferences in rats."
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- MOYSA, WILLIAM. "A study of the comparative value of predictive tests administered in the University High School, 1946 to 1948." M.Ed. Thesis, Alberta University, 1950. Pp. 105, MS. (Alberta).
- Munro, A. "An evaluation of a method of teaching human relations in secondary schools." M.A. Thesis, University of Toronto, 1950. Pp. 19, MS. (U. of T.).
- Neill, J. D. "Study of self-evaluation." M.A. Thesis, University of Toronto, 1950.
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- Newbigging, P. L. "Understanding others as a problem of perception: a study in individual differences." M.A. Thesis, University of Toronto, 1950. Pp. 43, MS. (U. of T.).
- NORTH, SIDNEY L. "Some studies in personality classification using a visual-motor psychological technique." M.A. Thesis, University of Western Ontario, 1950. Pp. 140, MS. (Western).
- O'Grady, Edmund Emmett. "John Ruskin's Ideas on Education." Ph.D. Thesis, University of Ottawa, 1950. Pp. 114, MS. (Ottawa).
- OLIVER, J. A. "An analysis of some new tests of disposition rigidity." M.A. Thesis, McGill University, 1950. Pp. 48, MS. (McGill).
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- PAUL, Inving H. "The modified auto-kinetic technique." M.A. Thesis, McGill University, 1950. Pp. 42, MS. (McGill).
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- PRESTON, C. F. "The formation of general concepts by touch." M.A. Thesis, University of Toronto, 1950. Pp. 58, MS. (U. of T.).
- PULLAN, VIVIAN. "A longitudinal study of absenteeism among school children and its relation to their present adjustment." M.A. Thesis, University of Toronto, 1950. Pp. 62, MS. (U. of T.).
- RILEY, L. P. "A study of associations to auditory stimuli." M.A. Thesis, University of Toronto, 1950. Pp. 42, MS. (U. of T.).
- ROBERT, GISÈLE. "Étude de 50 cas de filles-mères." Thèse de Licence en Psychologie, Université de Montréal, 1950. Pp. 58, MS. (Institut de Psychologie, Université de Montréal).
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Sandercock, Marian G. "An investigation of the causal reasoning process in schizophrenia." M.A. Thesis, University of Toronto, 1950. Pp. 38, MS. (U. of T.).

SAYERS, W. E. "A preliminary investigation of the personality factors related to practical judgment." M.A. Thesis, University of Toronto, 1950. Pp. 29, MS. (U. of T.).

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SHIRRAN, ALEXANDER F. "The construction and development of an objective carpenters' trade test." M.A. Thesis, The University of British Columbia, 1950. Pp. 92, MS. (U. B.C.).

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STEINBERG, J. "Construction evaluation of a mutual assessment scale for RCAF flight cadets." M.A. Thesis, University of Toronto, 1950. Pp. 25, MS. (U. of T.).

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Tuck, J. A. "A comparison of two modes of presentation in learning." M.A. Thesis, University of Toronto, 1950. Pp. 31, MS. (U. of T.).

URQUHART, GERMAINE M. "A study of negative behaviour in infants." M.A. Thesis, University of Toronto, 1950. Pp. 72, MS. (U. of T.).

Valin, Claire. "A survey of a shut-in population of dependent girls." M.A. Thesis, University of Ottawa, 1950. Pp. xii + 140, MS. (Ottawa).

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